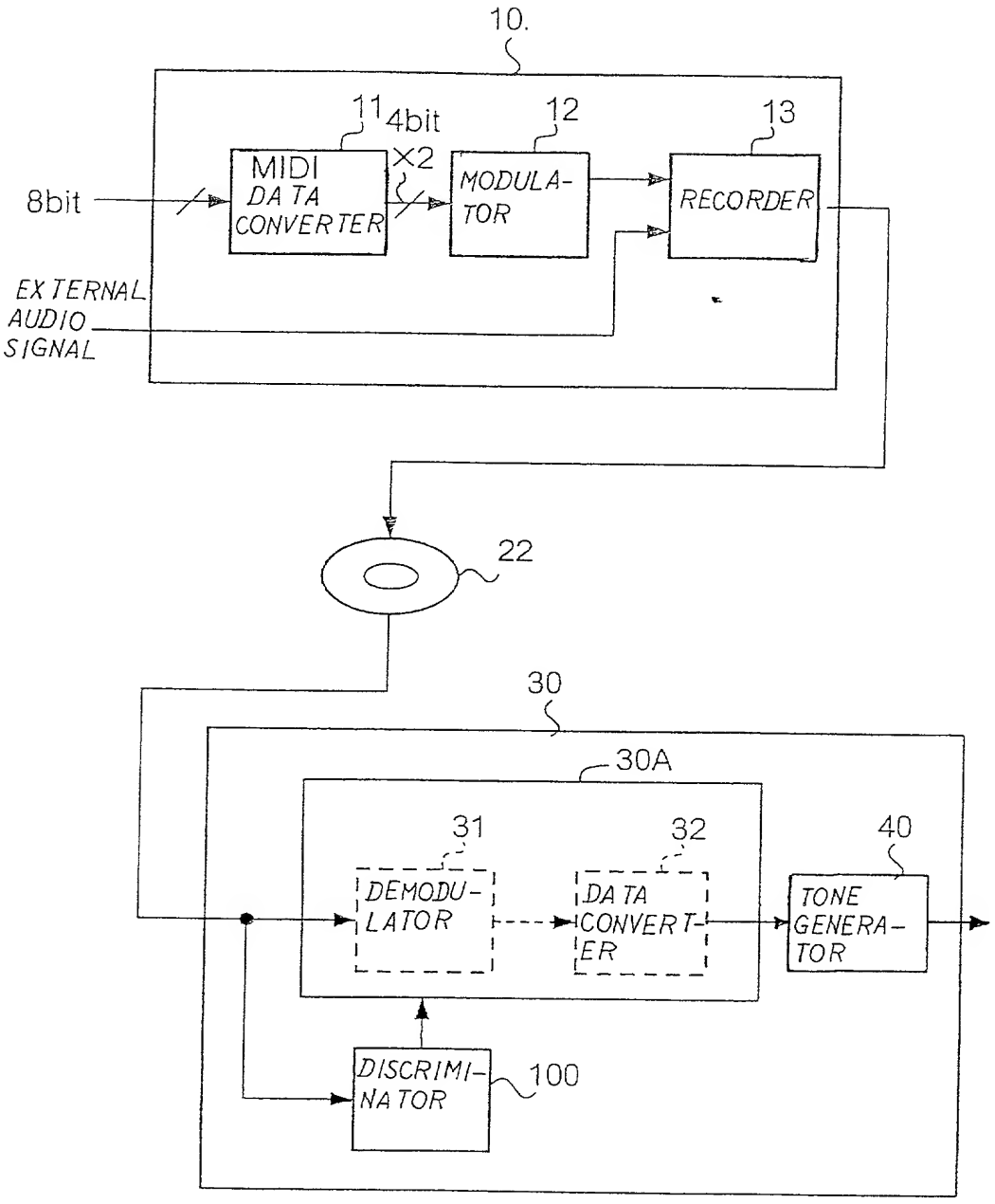
10.
11
4bit
12
13
MIDI
DATA
CONVERTER
X2
MODULA-
TOR
RECORDER
8bit
EXTERNAL
AUDIO
SIGNAL
22
30
30A
31
32
40
DEMODU-
LATOR
DATA
CONVERT-
ER
TONE
GENERA-
TOR
DISCRIMI-
NATOR
100

Fig. 1

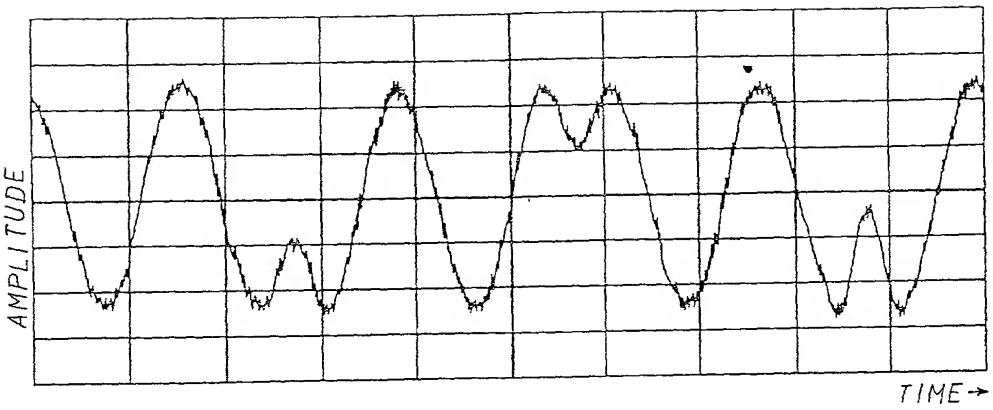

Fig. 2

EXPRESS MAIL NO. EV 045 888 308 US

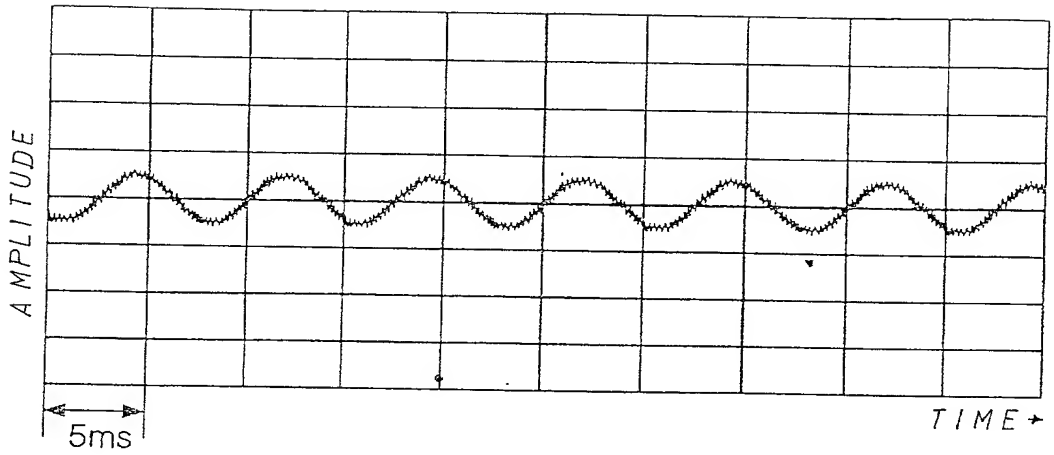

Fig. 3 A

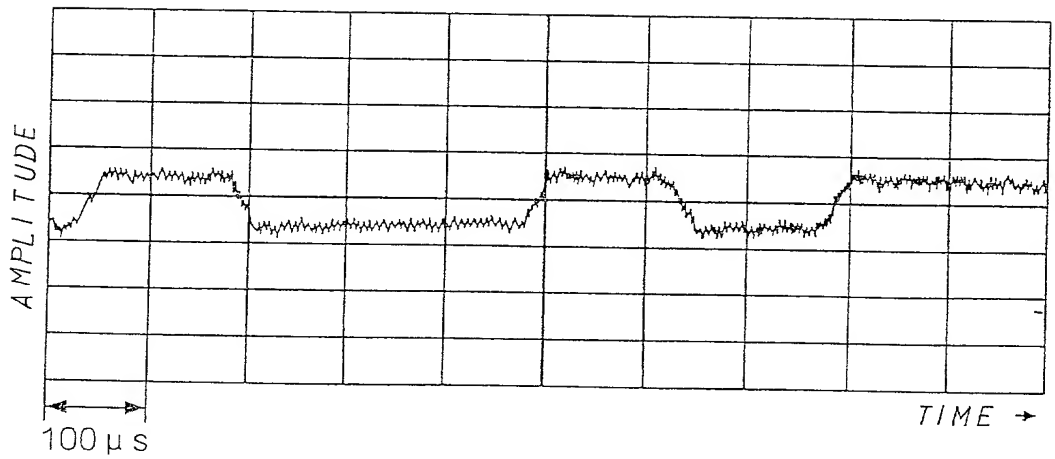

Fig. 3 B

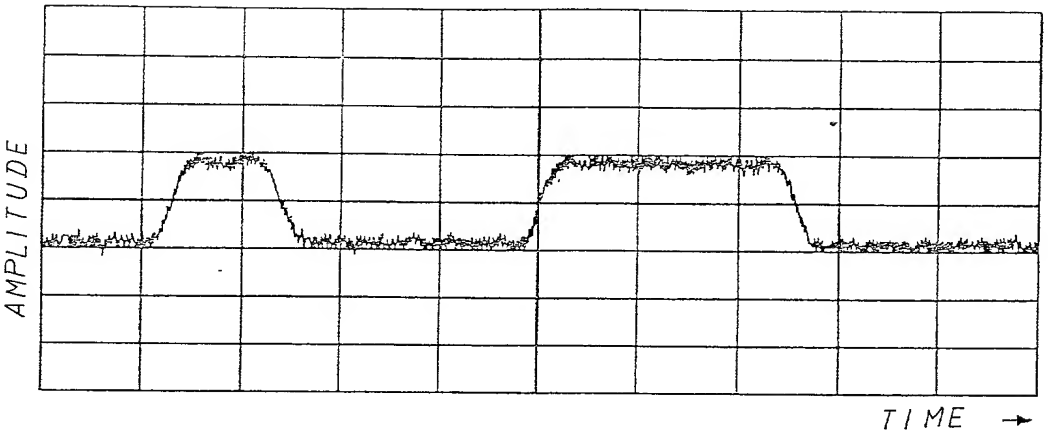

Fig. 4

PCT/JP2003/016393

20CFTO 98825001

ITEM	DESIGN	UNIT	NOTE
Recording channel for modulated signal	R	Channel	Audio signal is recorded in L-channel.
Bit rate	12.6	kbps (kilobits/sec.)	
Carrier frequency	6.30	KHz	
Symbol Velocity	3.15	K baud (kilo symbols /sec.)	
Bits of Symbol	4	bits/symbol	
Coding	4 – bit gray code		
Modulation	16 DPSK		
Demodulation	Synchronous detection		
Synchronization	Synchronous nibble		
Delay time of audio signal in recording	0	msec	
Delay time of audio signal in playback	500	msec	
Recording Level	– 6.0 to – 12.0	dB	Relative value with respect to full range.
Silent period	2.0 ≦	second	Necessary for symchronization.

Fig. 5

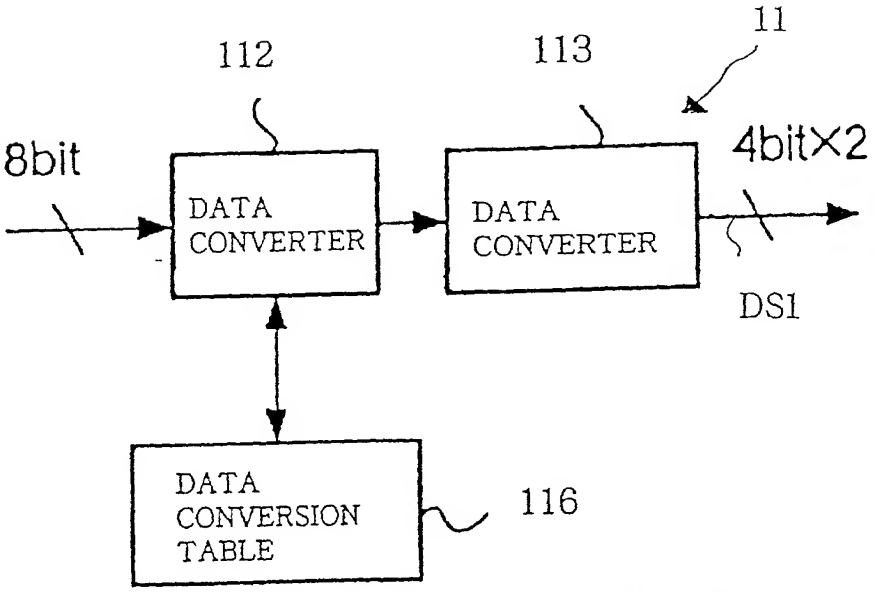

Fig. 6

US 393032030500

BIT STRING OF STATUS BYTE BEFORE DATA CONVERSION	BIT STRING AFTER DATA CONVERSION	DEFINITION OF STATUS BYTE
C0	C40	PROGRAM CHANGE AT CHANNEL 0
C1	C41	PROGRAM CHANGE AT CHANNEL 1
C2	C42	PROGRAM CHANGE AT CHANNEL 2
⋮	⋮	⋮
CF	C4F	PROGRAM CHANGE AT CHANNEL F
F0	C0	EXCLUSIVE
F1	C1	TIME CODE QUARTER FRAME
F2	C2	SONG POSITION POINTER
F3	C3	SONG SELECT
F4	C54	(NOT DEFINED)
F5	C55	(NOT DEFINED)
F6	C6	TUNE REQUEST
F7	C7	END OF EXCLUSIVE
F8	C8	TIMING CLOCK
F9	C9	(NOT DEFINED)
FA	CA	START
FB	CB	CONTINUE
FC	CC	STOP
FD	CD	(NOT DEFINED)
FE	CE	ACTIVE SENSING
FF	CF	SYSTEM REQUEST

Fig. 7

4005080 02/21/00

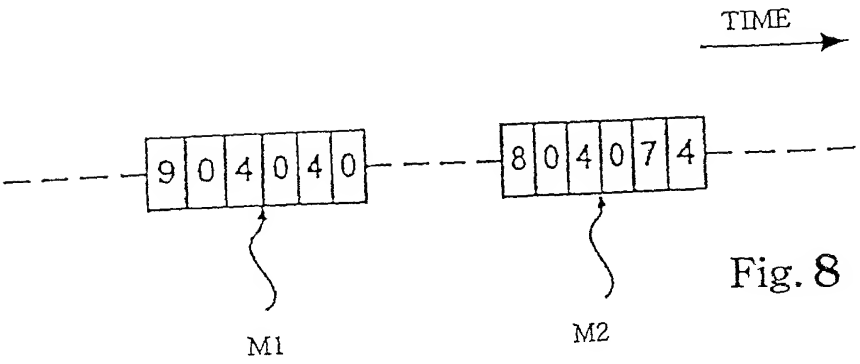

Fig. 8

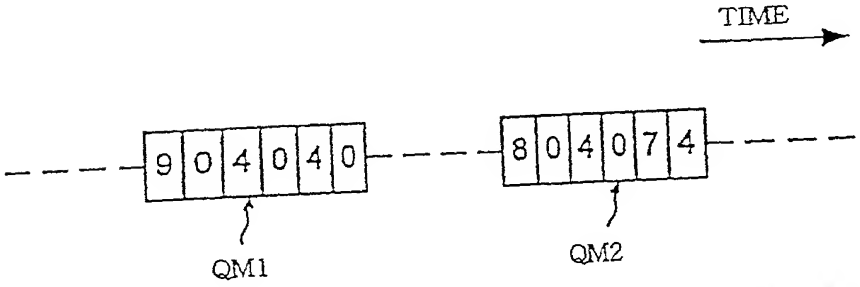

Fig. 9

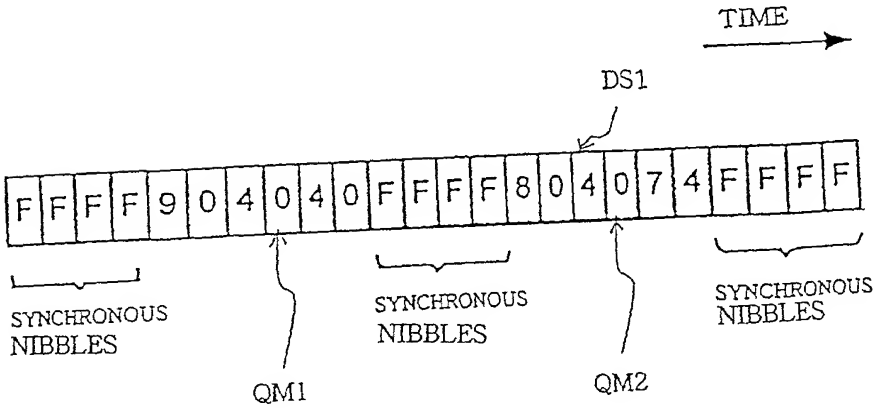

Fig. 10

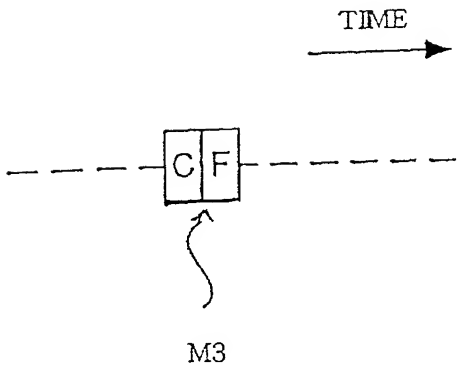

Fig. 11

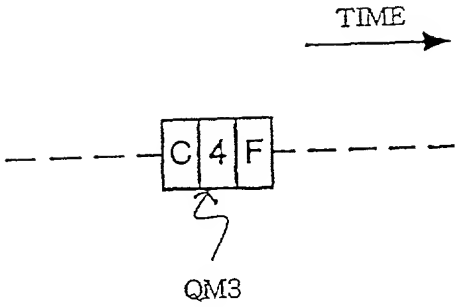

Fig. 12

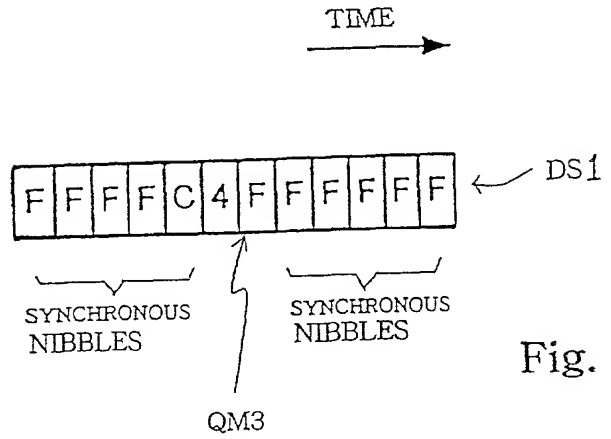

Fig. 13

EP 0 532 038 A2

Gray Code Data	POSITION [Dec]	PHASE [rad]	I – COMPONENT	Q – COMPONENT
1000	0	0	1	0
1010	1	0.392699	0.92388	0.382683
1110	2	0.785398	0.707107	0.707107
0110	3	1.178097	0.382683	0.92388
0010	4	1.570796	0	1
0011	5	1.963495	-0.38268	0.92388
0111	6	2.356194	-0.70711	0.707107
1111	7	2.748894	-0.92388	0.382683
1011	8	3.141593	-1	0
1001	9	3.534292	-0.92388	-0.38268
1101	10	3.926991	-0.70711	-0.70711
0101	11	4.31969	-0.38268	-0.92388
0001	12	4.712389	0	-1
0000	13	5.105088	0.382683	-0.92388
0100	14	5.497787	0.707107	-0.70711
1100	15	5.890486	0.92388	-0.38268

Fig. **1 4**

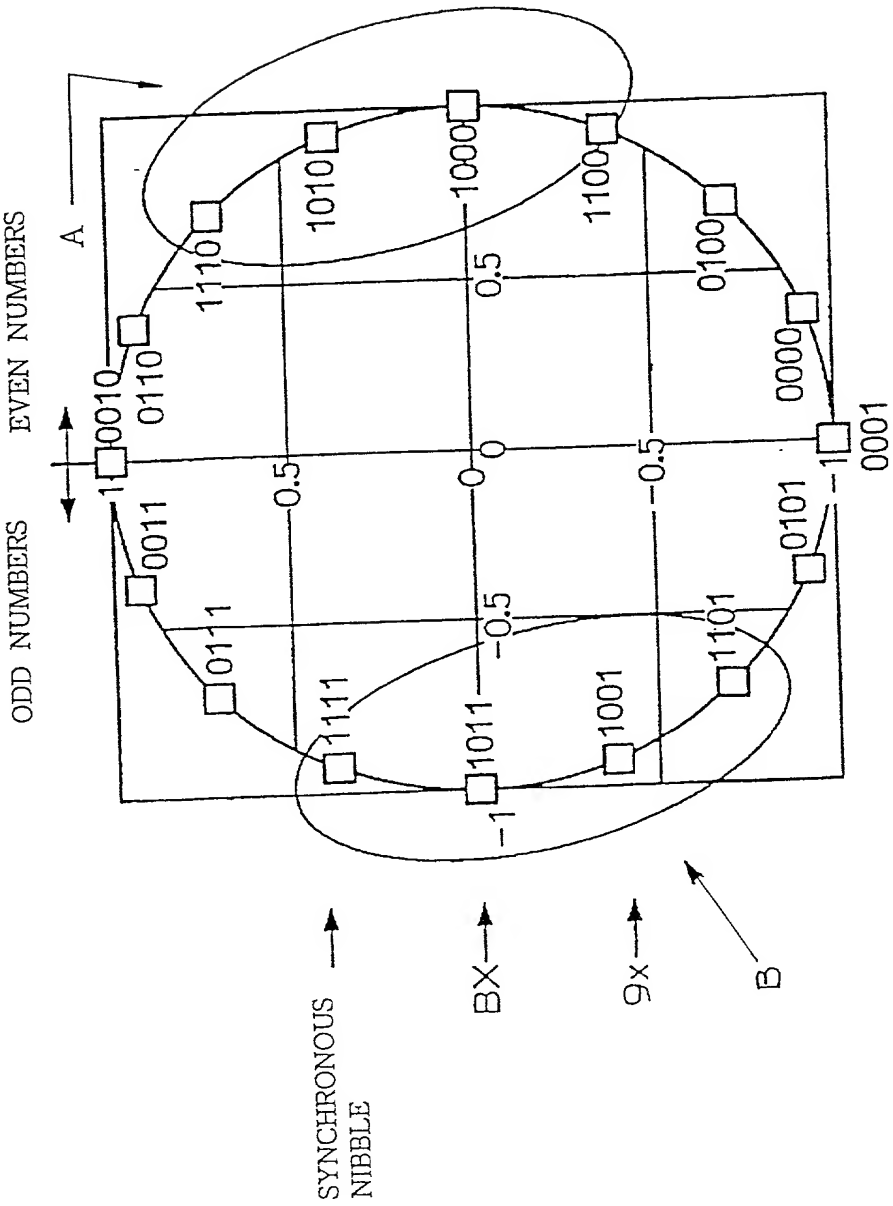
ODD NUMBERS
EVEN NUMBERS
A
B
SYNCHRONOUS NIBBLE
BX
9x
1
0.5
0
-0.5
-1
0010
0110
1110
1010
1000
1100
0100
0000
0001
0011
0111
1111
1011
1001
1101
0101

Fig. 15

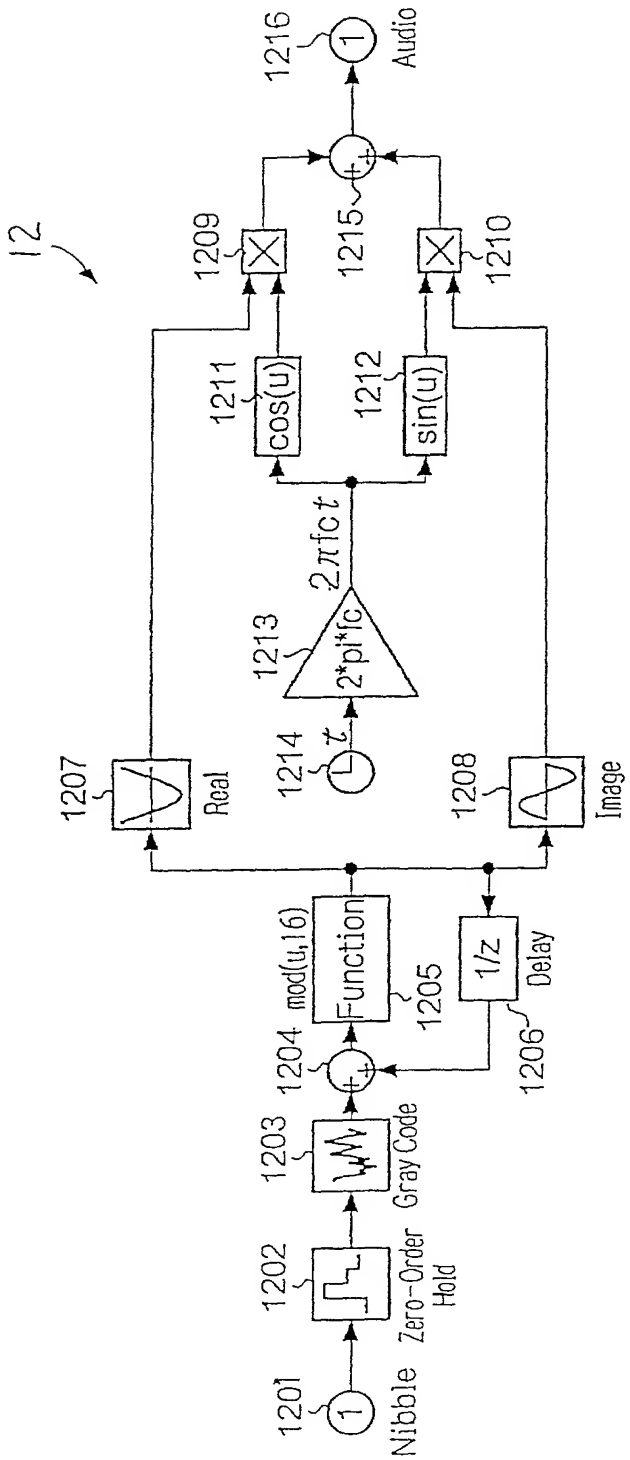
12
1201
Nibble
1202
Zero-Order Hold
1203
Gray Code
1204
1205
mod(u,16)
Function
1206
1/z
Delay
1207
Real
1208
Image
1209
1210
1211
cos(u)
1212
sin(u)
1213
2*pi*fc
1214
t
1215
1216
Audio

Fig. 16

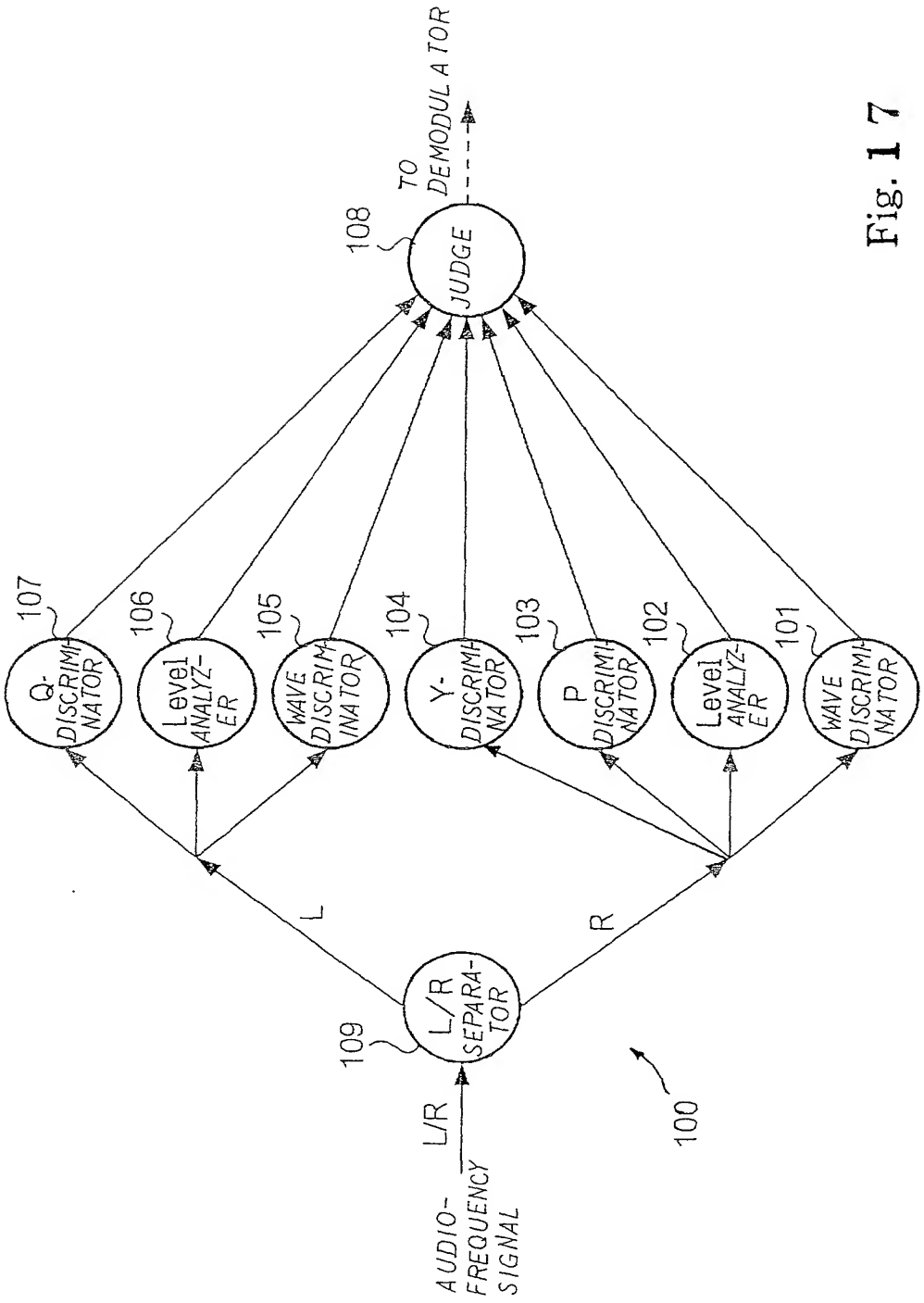
TO DEMODULATOR
108
JUDGE
107
Q-DISCRIMINATOR
106
Level ANALYZER
105
WAVE DISCRIMINATOR
104
Y-DISCRIMINATOR
103
P DISCRIMINATOR
102
Level ANALYZER
101
WAVE DISCRIMINATOR
L
R
109
L/R SEPARATOR
L/R
AUDIO-FREQUENCY SIGNAL
100

Fig. 17

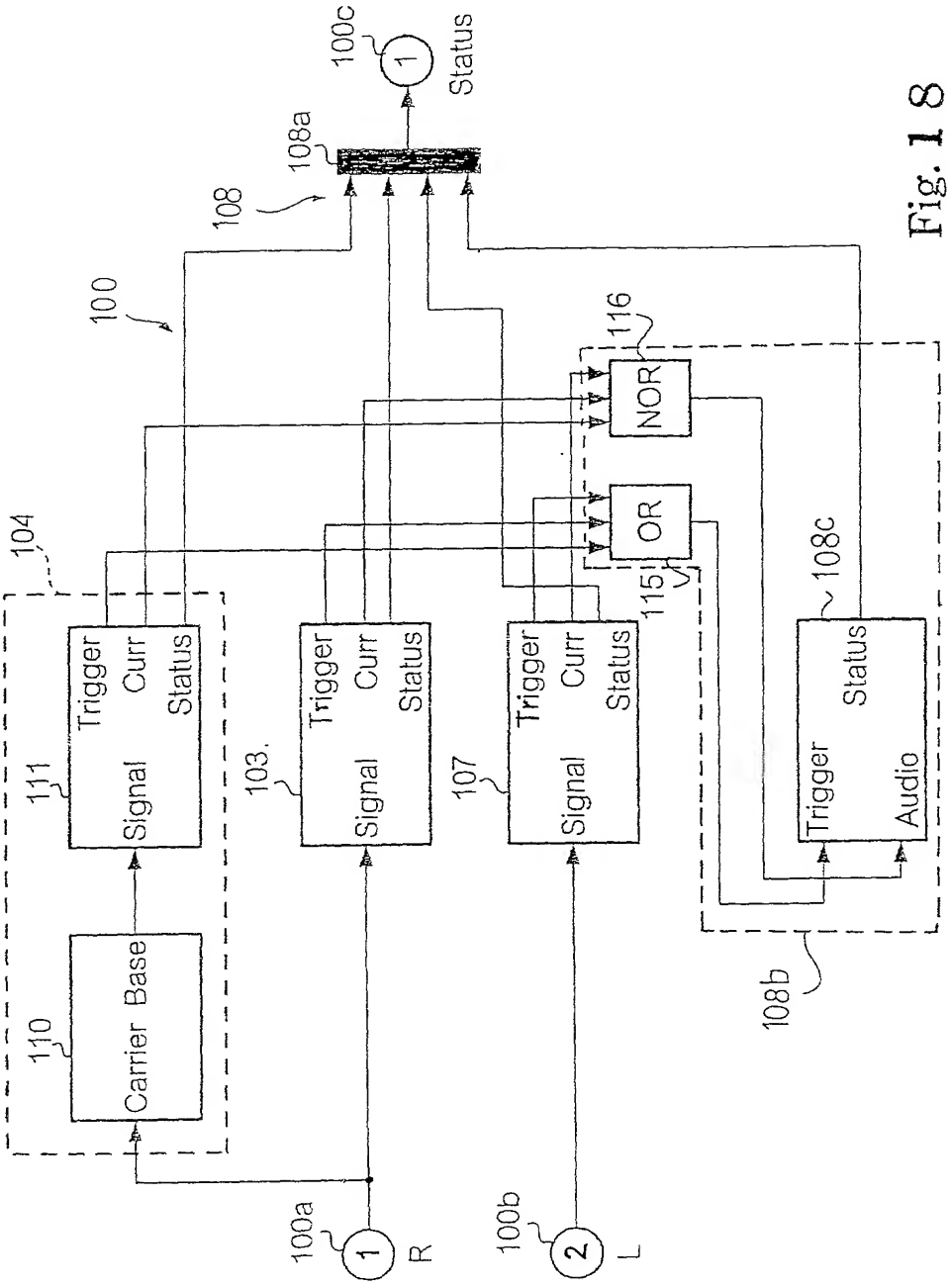

Fig. 18

393032030500

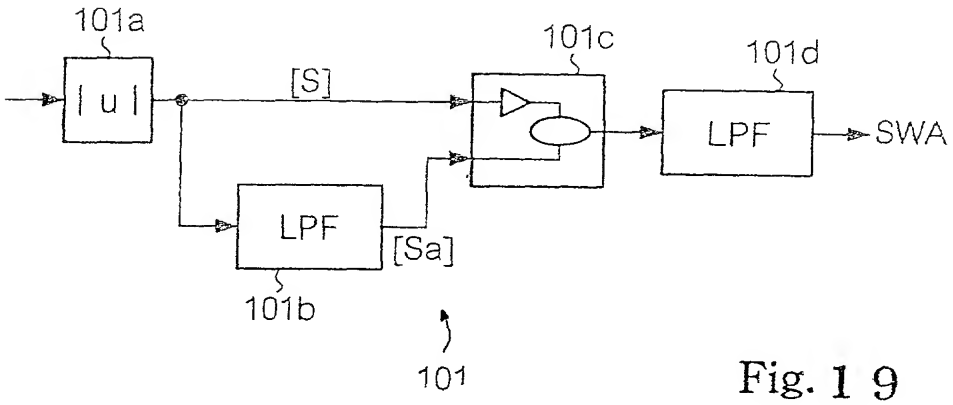
101a
| u |
[S]
101c
101d
LPF
SWA
LPF
[Sa]
101b
101

Fig. 19

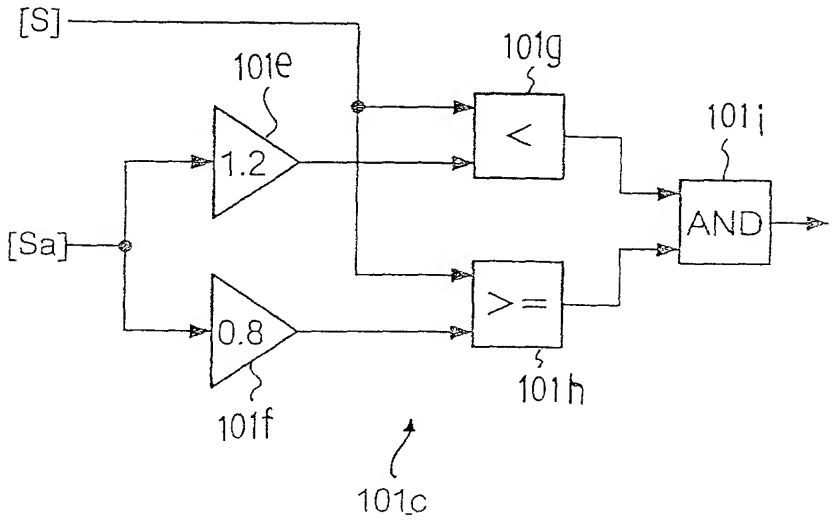
[S]
101e
1.2
101g
<
101j
AND
[Sa]
0.8
>=
101h
101f
101c

Fig. 20

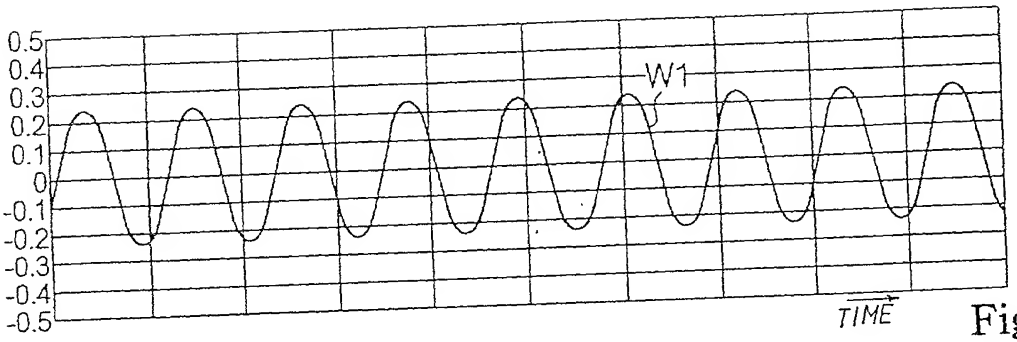

Fig.21

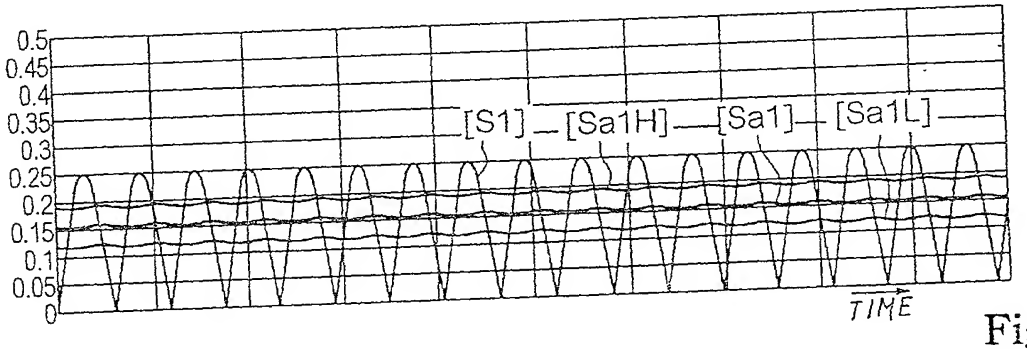

Fig.22

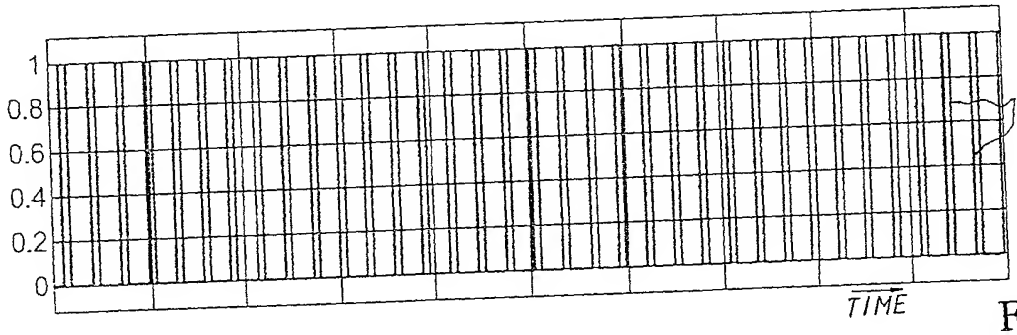

Fig.23

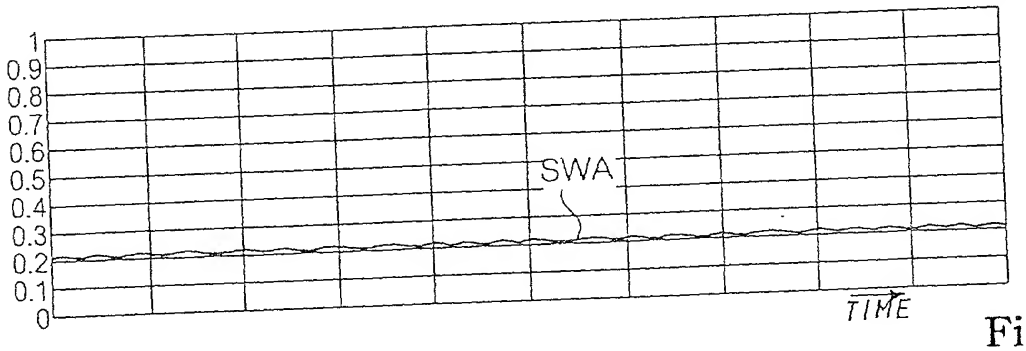

Fig.24

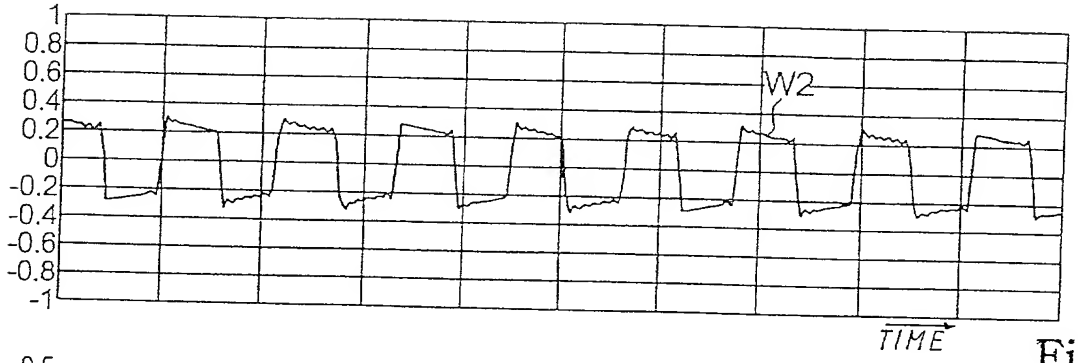

Fig. 2 5

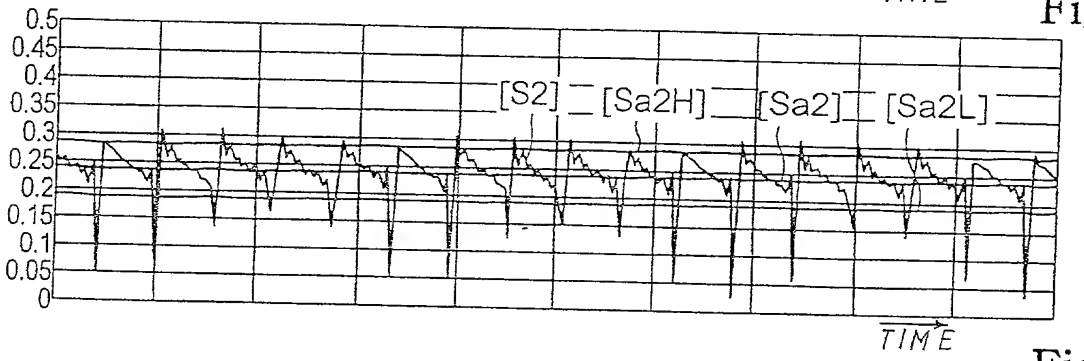

Fig. 2 6

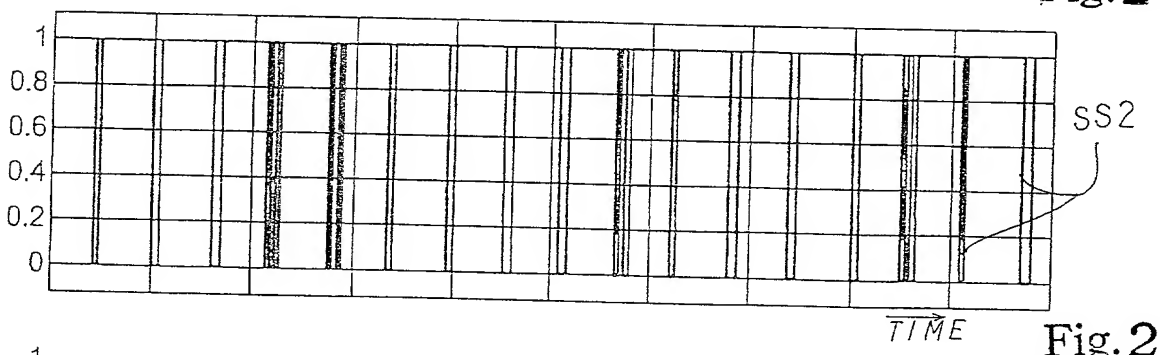

Fig. 2 7

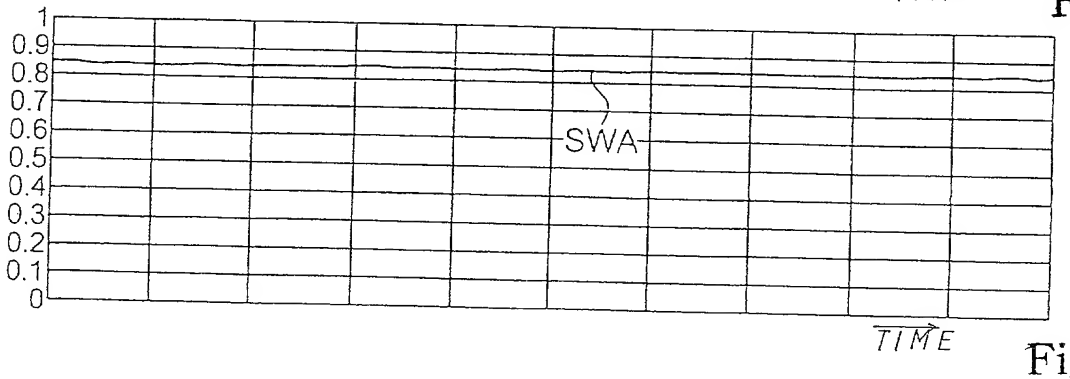

Fig. 2 8

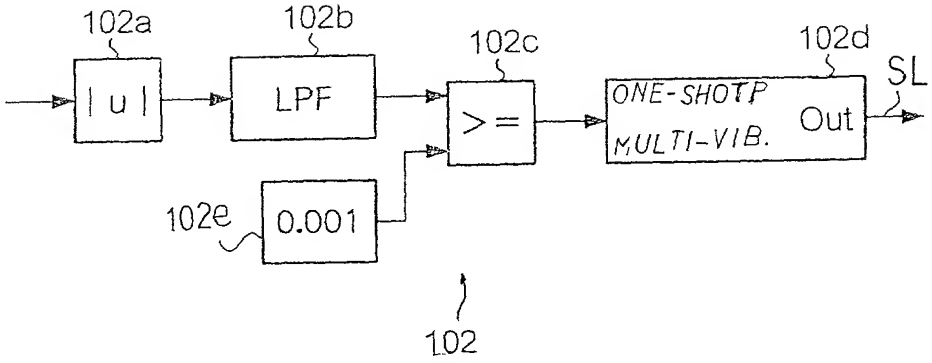
102a
102b
102c
102d
SL
| u |
LPF
>=
ONE-SHOTP
MULTI-VIB.
Out
102e
0.001
102

Fig. 29

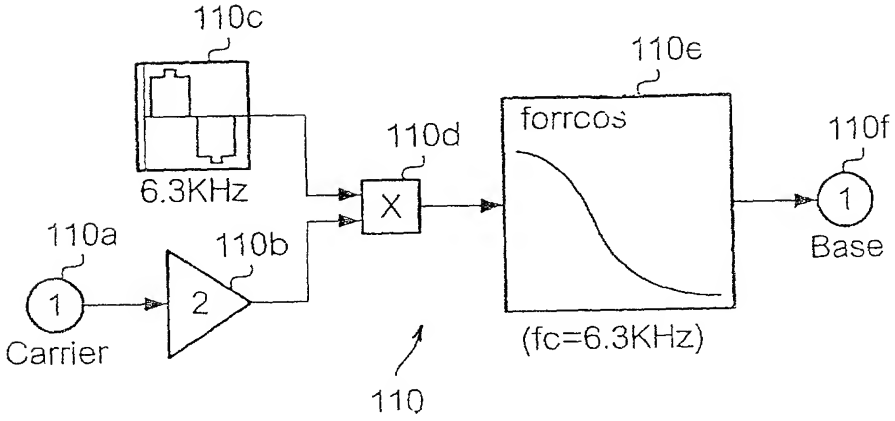
110c
110e
110d
110f
forrcos
6.3KHz
X
1
Base
110a
110b
1
2
Carrier
(fc=6.3KHz)
110

Fig. 30

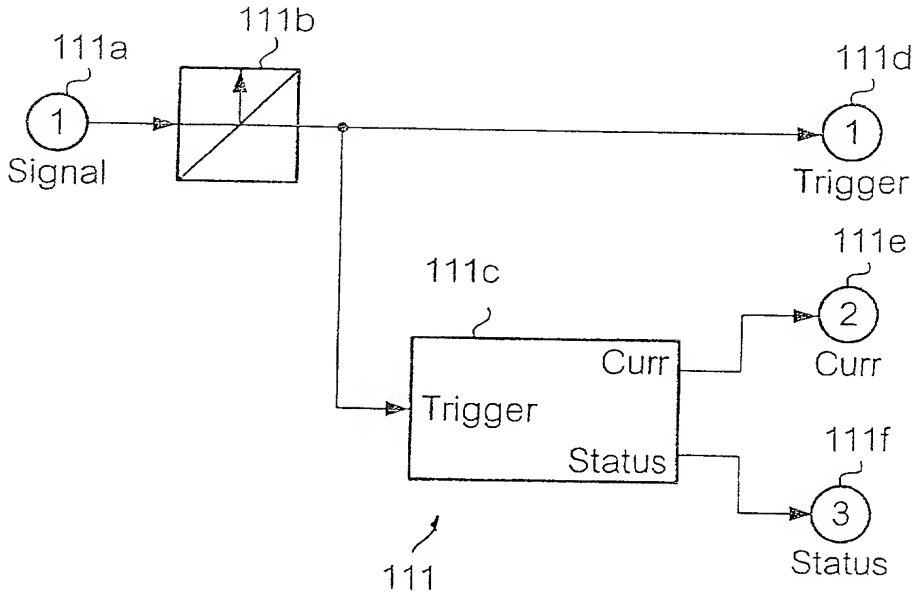
111a
111b
111d
1
Signal
1
Trigger
111e
111c
2
Curr
Curr
Trigger
Status
111f
3
Status
111

Fig. 31

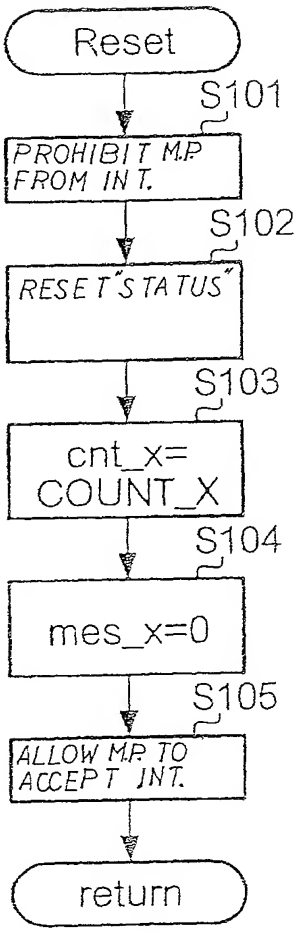

Fig. 32A

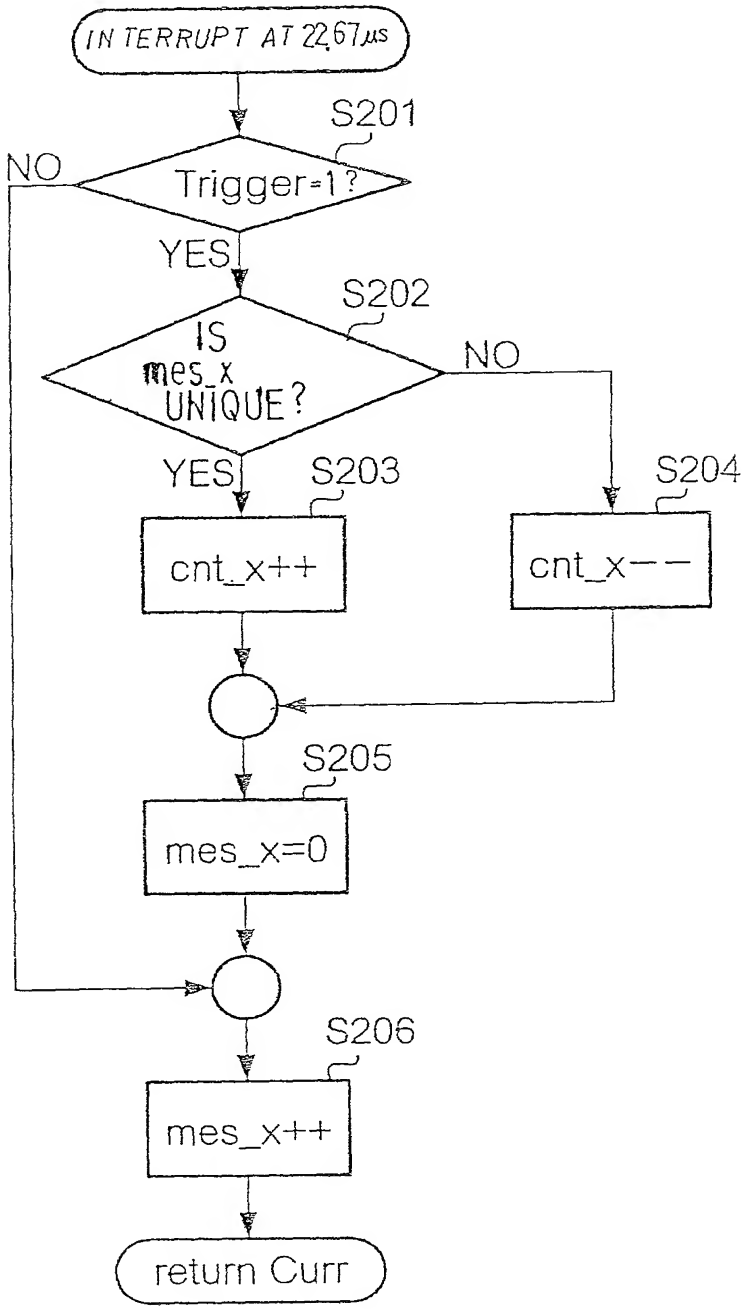

Fig. 32B

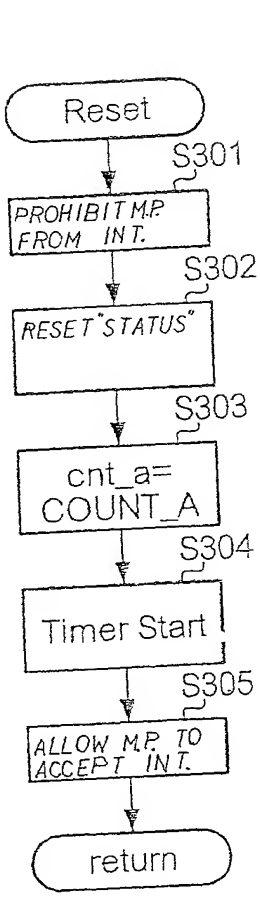

Fig. 33 A

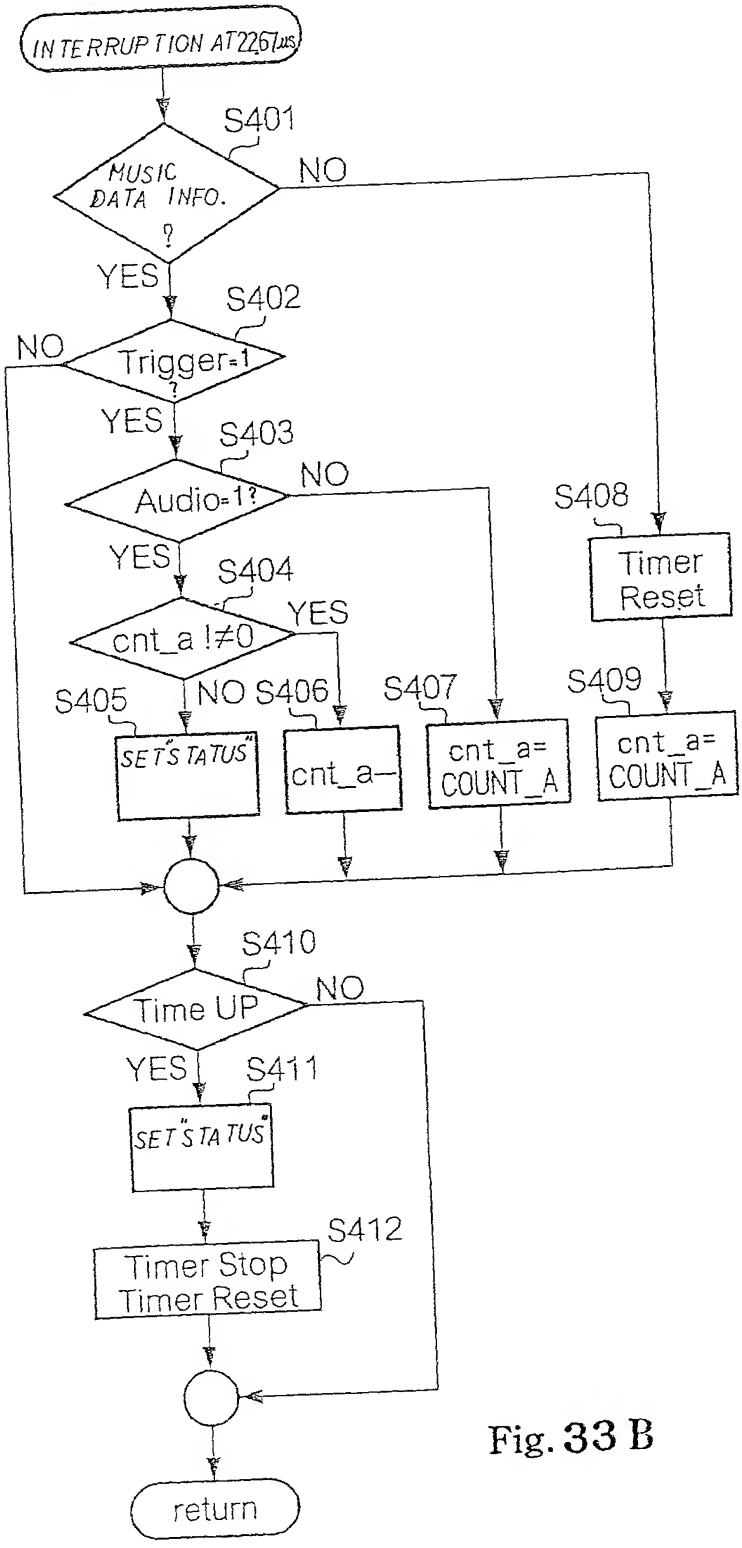

Fig. 33 B

AUDIO FRQ.S.	Y-MOD. DISCRIM.	Q-MOD. DISCRIM.	P-MOD. DISCRIM.	L Level	R Level	L WAVE DISCRIM.	R WAVE DISCRIM.	Time-out	JUDGE
NIBBLE STREAM { ANALYZE HEADPORTION ONLY OTHER IS SILENT }	cnt_y>=TH_YH	–	–	SL	–	–	wav_r<TH_SINR	NO	Y-MOD.
	–	cnt_qp>=TH_QPH	–	–	SL	wav_l<TH_SINL	–	NO	Q-MOD. WHEN BOTH ARE SATISFIED.
	–	cnt_qc>=TH_QCH	–	–	SL	wav_l>=TH_SQRL	–	NO	
	–	–	cnt_p>=TH_PH	SL	–	–	wav_r>=TH_SQRR	NO	P-MOD.
	cnt_y<=TH_YL	cnt_qp<=TH_QPL && cnt_qc<=TH_QCL	cnt_p<=TH_PL	–	–	–	–	NO	Audio
	–	–	–	–	–	–	–	YES	Audio
EXTERNAL AUDIO SIGNAL	cnt_y>=TH_YH	–	–	–	–	–	wav_r<TH_SINR	NO	X-MOD.
	–	cnt_qp>=TH_QPH	–	–	SL	wav_l<TH_SINL	–	NO	Q-MOD.
	–	cnt_qc>=TH_QCH	–	–	–	wav_l>=TH_SQRL	–	NO	Q-MOD.
	–	–	cnt_p>=TH_PH	–	–	–	wav_r>=TH_SQRR	NO	P-MOD.
	cnt_y<=TH_YL	cnt_qp<=TH_QPL && cnt_qc<=TH_QCL	cnt_p<=TH_PL	–	–	–	–	NO	Audio
	–	–	–	–	–	–	–	YES	Audio

Fig. 34

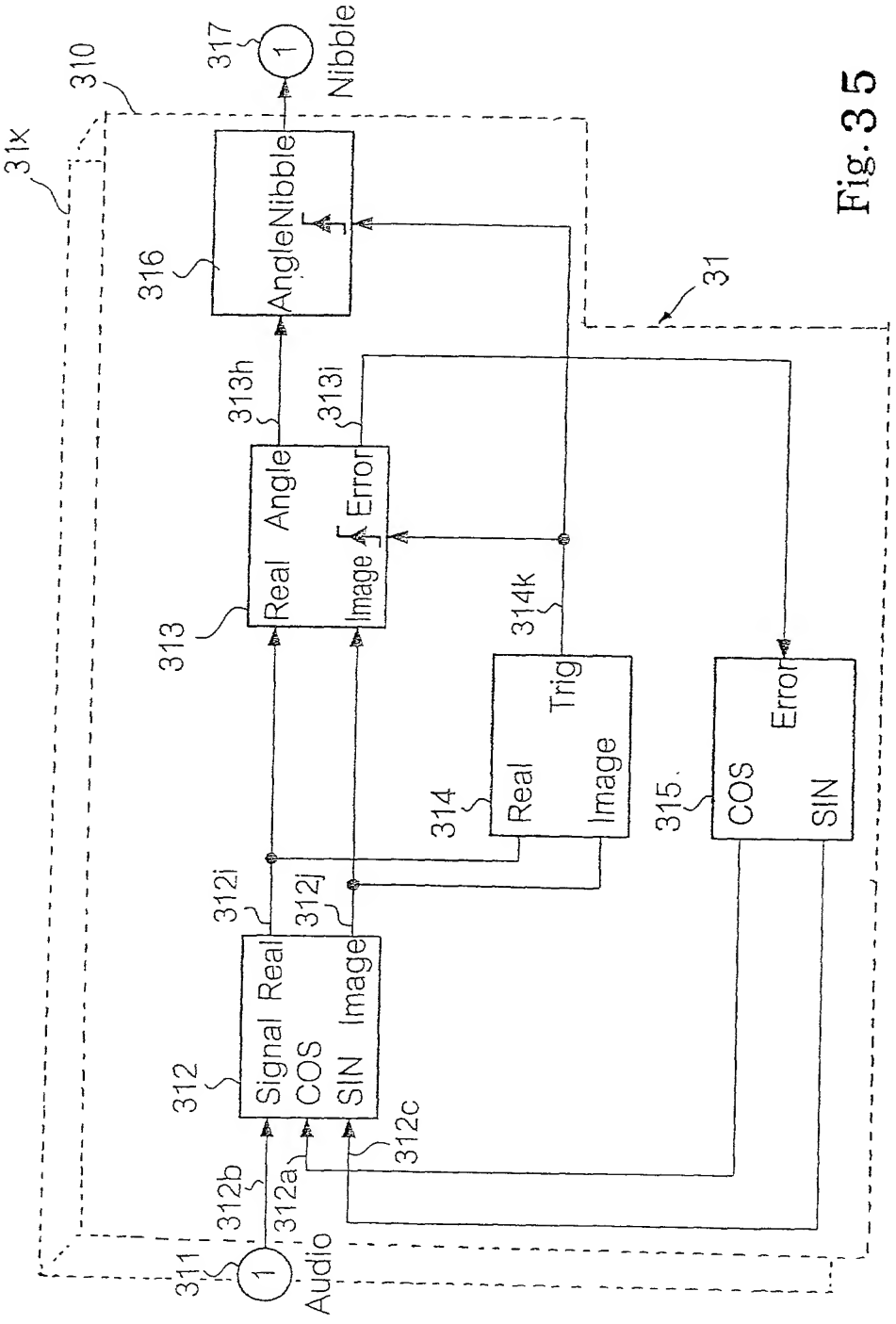
31x
310
317
1
Nibble
316
AngleNibble
31
313h
313i
Real Angle
Image Error
313
314k
Trig
Real
Image
314
315
COS
Error
SIN
312i
312j
Signal Real
COS
SIN Image
312
312c
312b
312a
311
1
Audio

Fig. 35

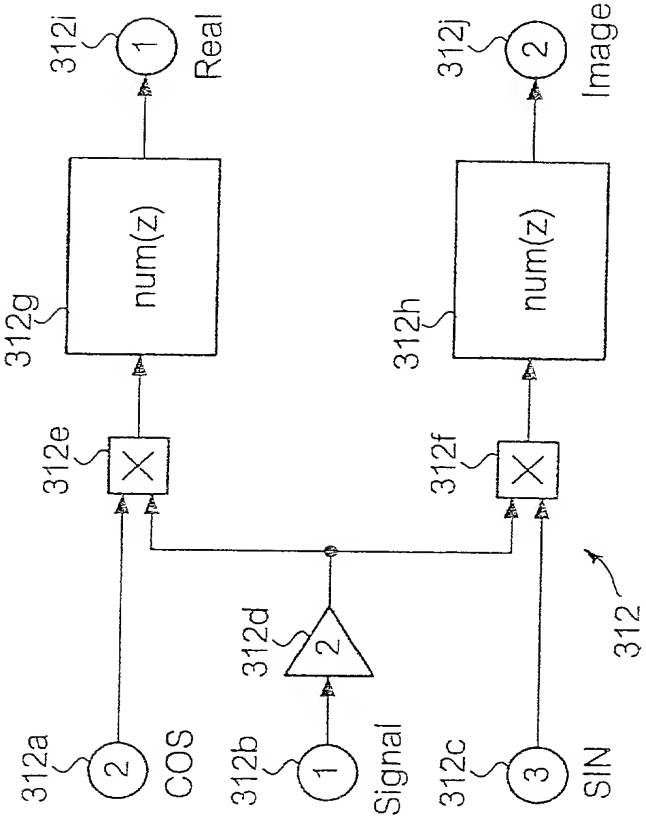

Fig. 36

20020 "82e5900b

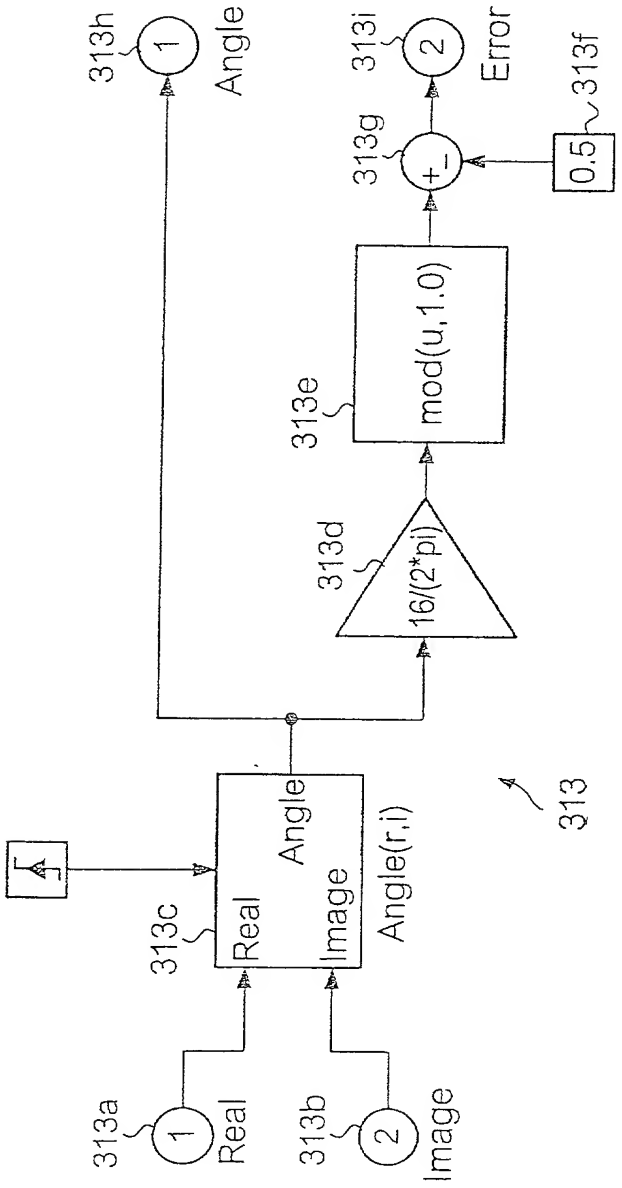
313h
1
Angle
313i
2
Error
313g
+_
313f
0.5
313e
mod(u,1.0)
313d
16/(2*pi)
313
313c
Real
Image
Angle
Angle(r,i)
313a
1
Real
313b
2
Image

Fig. 37

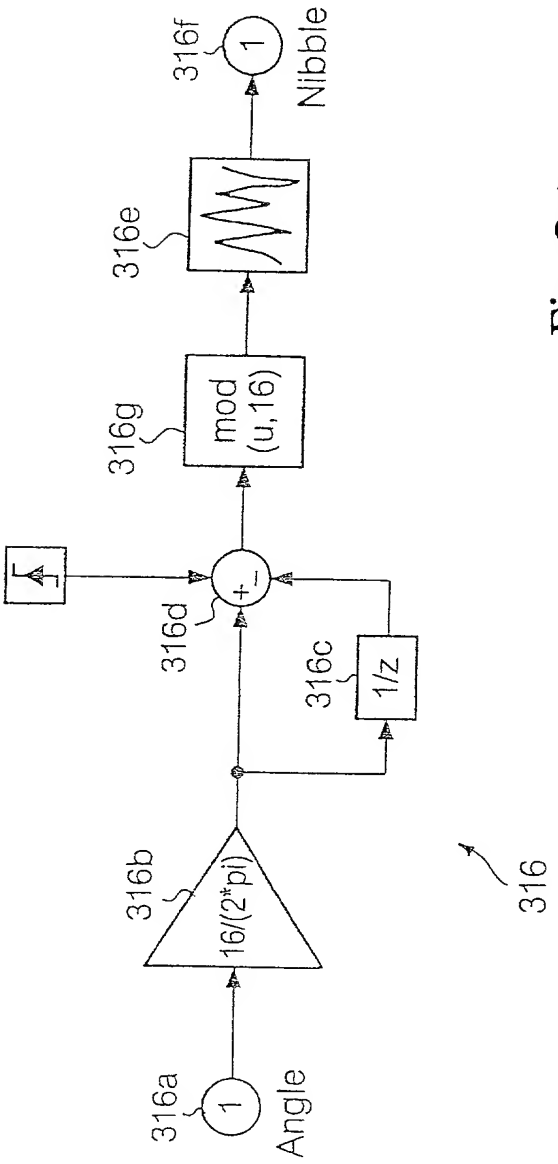

Fig. 38

20050058298

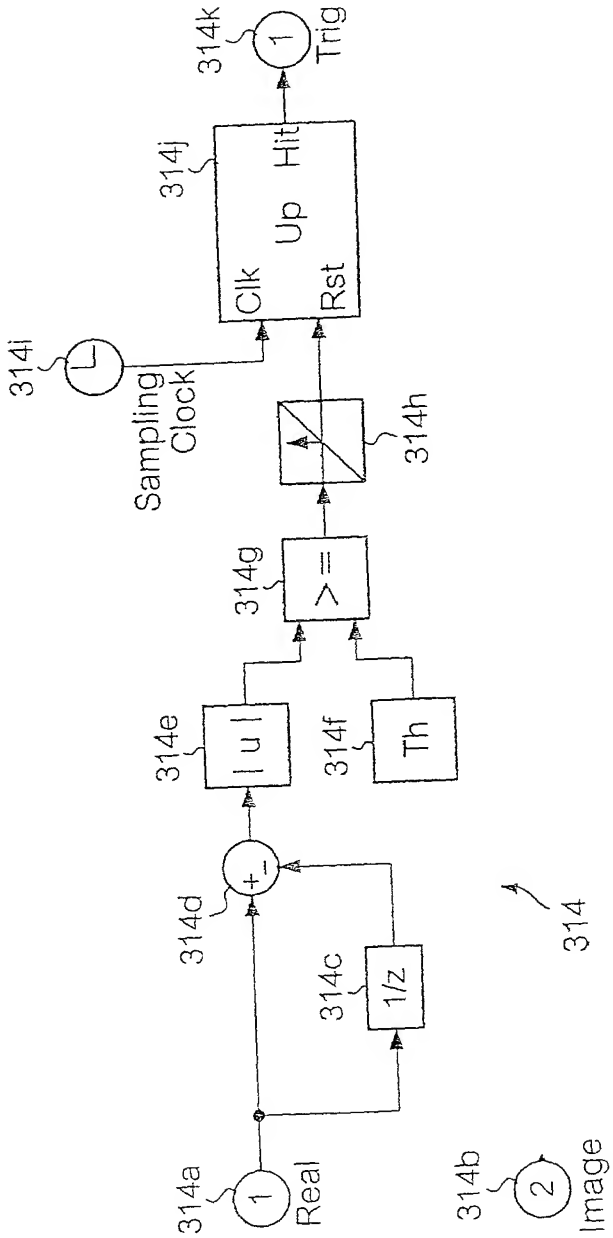

Fig. 39

Docket #393032030500

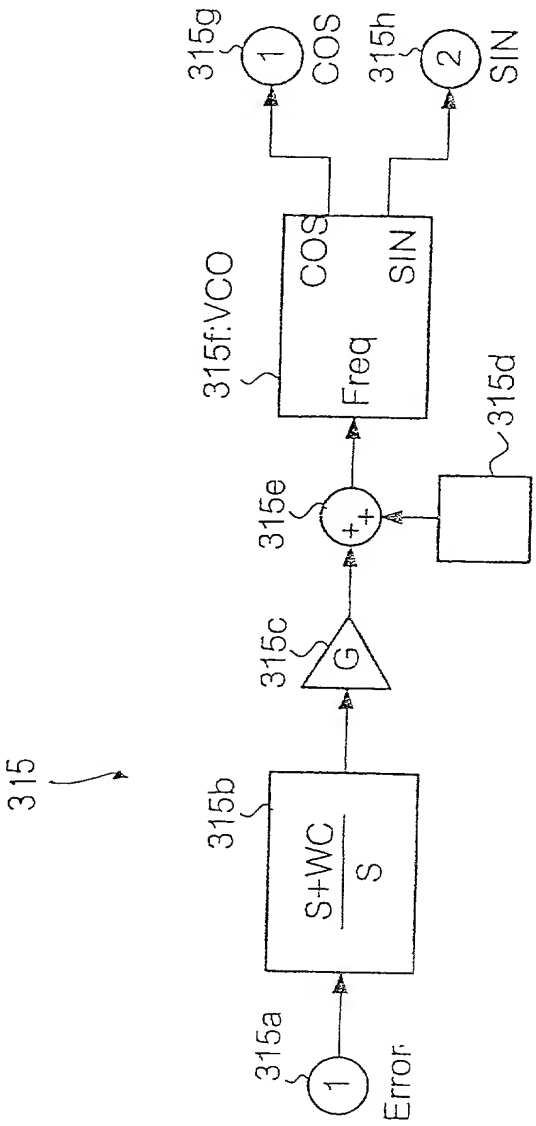

Fig. 40

20070228.0057

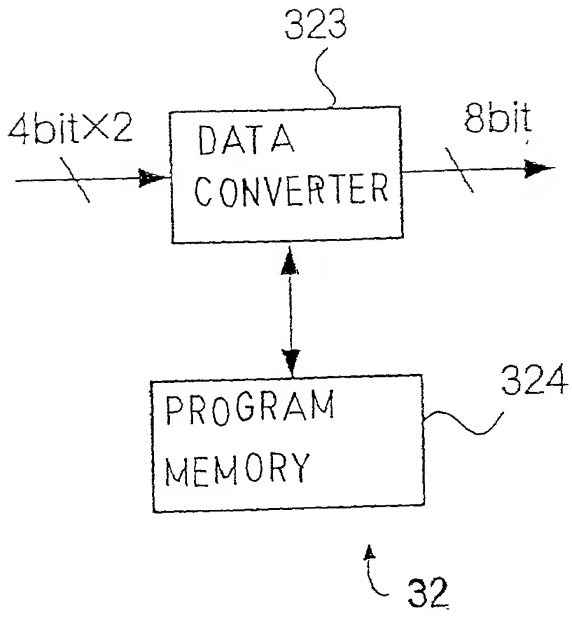

Fig. 41

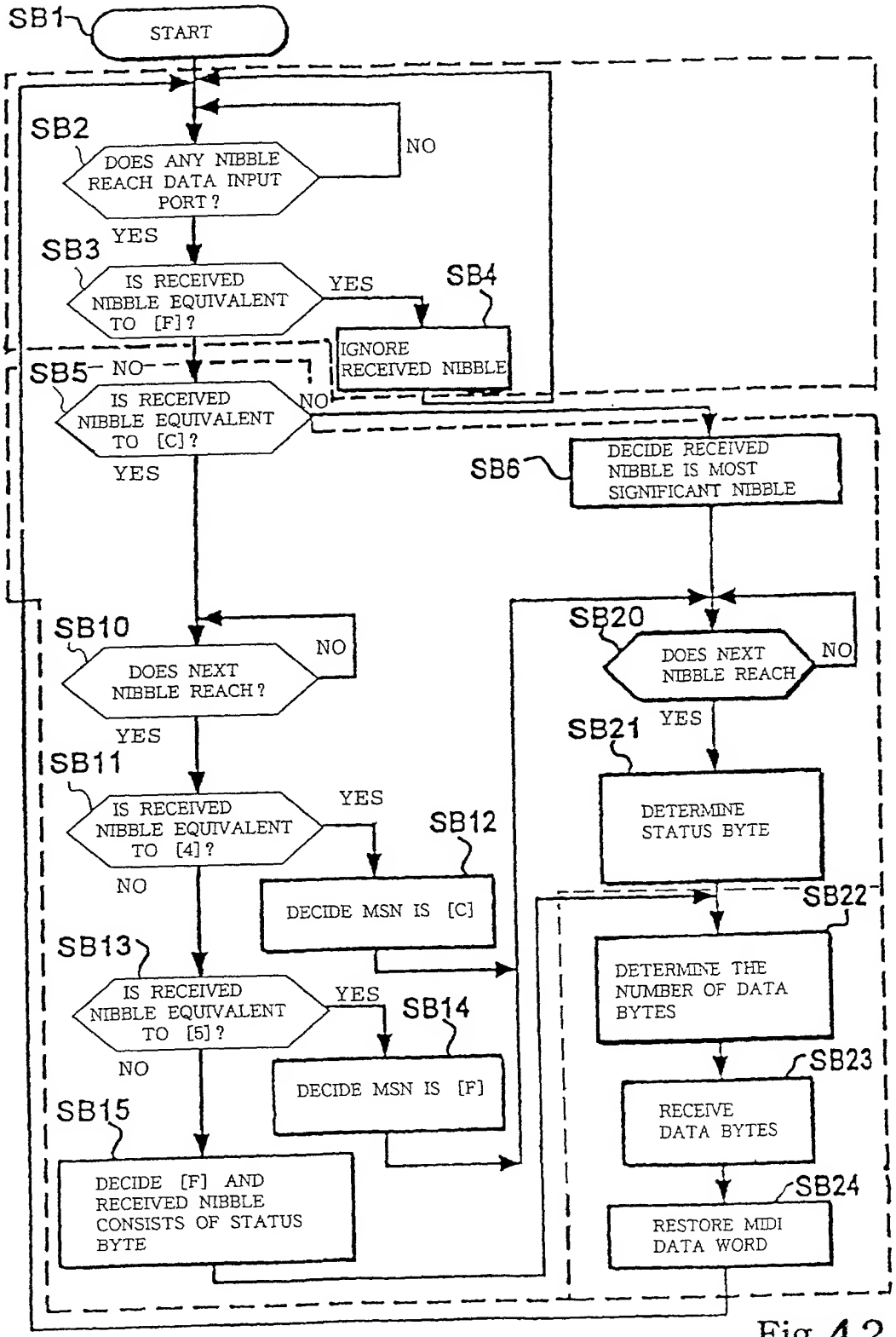
SB1
START
SB2
DOES ANY NIBBLE REACH DATA INPUT PORT?
NO
YES
SB3
IS RECEIVED NIBBLE EQUIVALENT TO [F]?
YES
SB4
IGNORE RECEIVED NIBBLE
SB5
NO
IS RECEIVED NIBBLE EQUIVALENT TO [C]?
NO
YES
SB6
DECIDE RECEIVED NIBBLE IS MOST SIGNIFICANT NIBBLE
SB10
DOES NEXT NIBBLE REACH?
NO
YES
SB11
IS RECEIVED NIBBLE EQUIVALENT TO [4]?
YES
SB12
DECIDE MSN IS [C]
NO
SB13
IS RECEIVED NIBBLE EQUIVALENT TO [5]?
YES
SB14
DECIDE MSN IS [F]
NO
SB15
DECIDE [F] AND RECEIVED NIBBLE CONSISTS OF STATUS BYTE
SB20
DOES NEXT NIBBLE REACH
NO
YES
SB21
DETERMINE STATUS BYTE
SB22
DETERMINE THE NUMBER OF DATA BYTES
SB23
RECEIVE DATA BYTES
SB24
RESTORE MIDI DATA WORD

Fig. 42

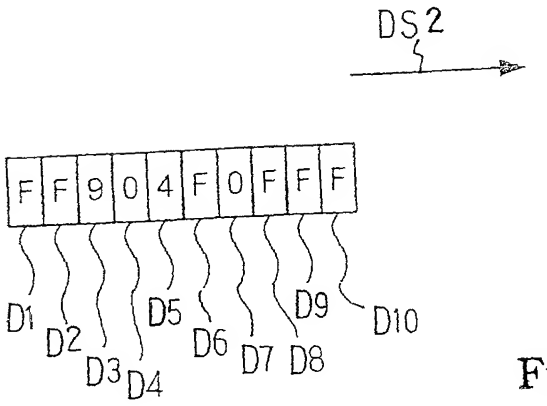
DS2
F F 9 0 4 F 0 F F F
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10

Fig. 43

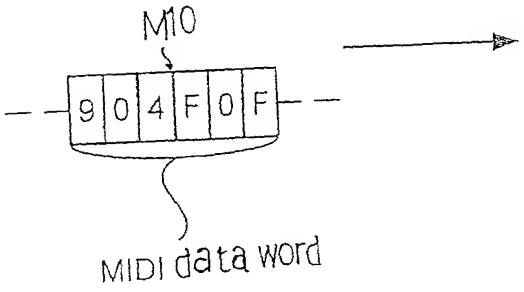
M10
9 0 4 F 0 F
MIDI data word

Fig. 44

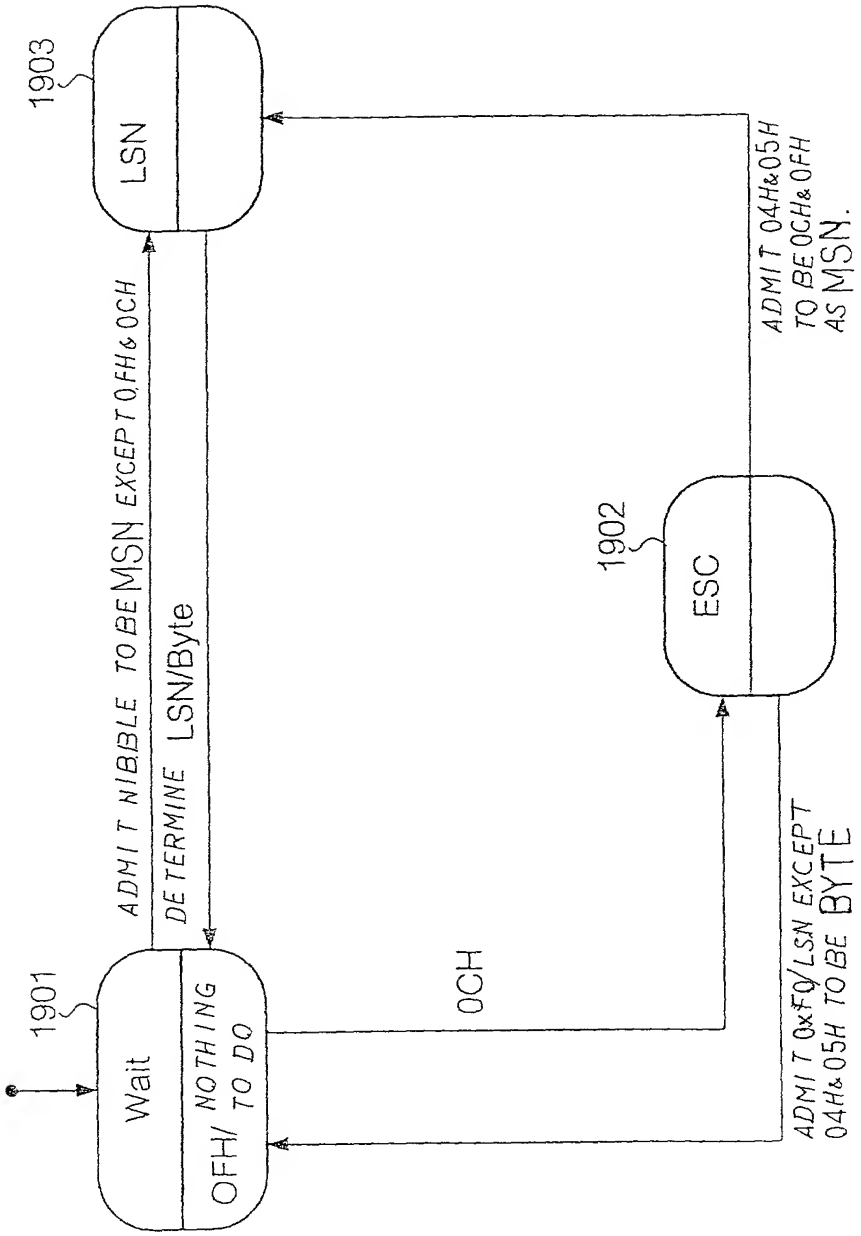
1903
LSN
1902
ESC
1901
Wait
OFH/ NOTHING TO DO
ADMIT NIBBLE TO BE MSN EXCEPT 0FH & 0CH
DETERMINE LSN/Byte
0CH
ADMIT 04H&05H TO BE 0CH&0FH AS MSN.
ADMIT 0xF0/LSN EXCEPT 04H&05H TO BE BYTE

Fig. 45